

## Chapter 16: Floodplains

<b>16.1</b>	<b>Introduction .....</b>	<b>16-1</b>
<b>16.2</b>	<b>Regulatory Setting.....</b>	<b>16-2</b>
16.2.1	Federal Emergency Management.....	16-2
16.2.2	Executive Order 11988, Floodplain Management.....	16-3
<b>16.3</b>	<b>Affected Environment.....</b>	<b>16-4</b>
16.3.1	Resource Identification Methods .....	16-4
16.3.2	Salt Lake County.....	16-5
16.3.3	Utah County .....	16-9
<b>16.4</b>	<b>Environmental Consequences .....</b>	<b>16-11</b>
16.4.1	Methodology .....	16-11
16.4.2	No-Action Alternative.....	16-13
16.4.3	Salt Lake County Alternatives .....	16-13
16.4.4	Utah County Alternatives.....	16-21
16.4.5	Mitigation Measures.....	16-28
16.4.6	Cumulative Impacts .....	16-28
16.4.7	Summary of Impacts .....	16-29
<b>16.5</b>	<b>References .....</b>	<b>16-30</b>

### 16.1 Introduction

Floodplains are defined as normally dry areas that are occasionally inundated by stormwater runoff or high lake water. Development in floodplains can reduce their flood-carrying capacity and extend the flooding hazard beyond the developed area.

***Floodplain Impact Analysis Area.*** Many of the rivers and creeks that traverse the Mountain View Corridor (MVC) study area have floodplains. These creeks and rivers originate in the mountains west of the MVC study area in Salt Lake County and east of the study area in Utah County. Therefore runoff from the Oquirrh, Traverse, and Wasatch Mountains influences the water courses and water bodies in the MVC study area. The floodplain impact analysis area is the same as the MVC study area (see Section 1.1, Study Area Description, in Chapter 1).

## 16.2 Regulatory Setting

### 16.2.1 Federal Emergency Management

In response to escalating taxpayer costs for flood disaster relief, Congress established the National Flood Insurance Program. This program is a voluntary mitigation program administered by the Federal Emergency Management Agency (FEMA). Under this program, the federal government makes flood insurance available in those communities that practice sound floodplain management. This incentive encourages state and local governments to develop and implement floodplain management programs.

In the 1980s, FEMA performed location hydrologic and hydraulic studies to identify and map special flood hazard areas within communities. A result of the FEMA studies is the development of flood insurance rate maps that show the floodplain for each river, lake, or other surface water resource that was studied. A special flood hazard area is the area that would be inundated by a 100-year flood. The 100-year flood is defined as a runoff event with a 1% chance of occurring in any given year. Special flood hazard areas are given a zone designation based on the level of detail of the FEMA study and the anticipated type of flooding. There are several types of zones, but the following zones are most relevant for the MVC:

- **Zone A** – Areas subject to inundation by a base flood (that is, a flood with a 1% chance of occurring in any given year). These areas are identified by approximate studies and no base flood elevations are established.
- **Zone AE** – Areas subject to inundation by a base flood as determined by detailed methods. Base flood elevations are established.
- **Zone AH** – Areas subject to shallow flooding during a base flood. These are typically areas of ponding where average depths are between 1 foot and 3 feet (FEMA 2006).

The 100-year floodplain for rivers and streams is the area in and around the river or stream that would be inundated by a 100-year flood. In AE zones, this floodplain consists of both the floodway and the floodway fringe as shown in Figure 16-1, Floodway Schematic (FEMA 2007). The floodway is the defined stream channel and the adjacent areas that must be kept free of encroachment to pass the 100-year flood without increasing the water surface elevation more than a designated height. The floodway fringe is the area between the floodway and the boundary of the floodplain. Similarly, the 100-year floodplain for lakes and

reservoirs is the area in and around the lake or reservoir that would be inundated by a 100-year flood.

### 16.2.2 Executive Order 11988, Floodplain Management

Executive Order 11988, Floodplain Management (May 24, 1977), established federal policy “to avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative.”

Based on Executive Order 11988, the Federal Highway Administration (FHWA) adopted regulations governing the development of projects that could have impacts on floodplains (23 Code of Federal Regulations [CFR] Part 650, Subpart A). These regulations state that FHWA will not approve a project that involves a “significant encroachment” on a floodplain unless FHWA finds that the proposed significant encroachment is the “only practicable alternative” (23 CFR 650.113). What constitutes a “significant encroachment” is determined on a case-by-case basis by considering adjacent development. FEMA has set a 1-foot increase in the 100-year flood elevation as the upper limit of the allowable encroachment caused by a project.

Under FHWA’s regulations, a significant encroachment can arise from any of the following situations:

- Significant potential for interfering with a transportation facility that is needed for emergency vehicles or that provides a community’s only evacuation route
- A significant risk of upstream flooding
- A significant adverse impact on natural and beneficial floodplain values

Natural and beneficial floodplain values include flood conveyance, storage, and control; groundwater recharge; water quality function; and wildlife habitat and diversity.

Furthermore, it is FHWA’s policy “to avoid longitudinal encroachments, where practicable” (23 CFR 650.103(b)). Longitudinal encroachments are parallel or nearly parallel to a stream or the edge of a lake.

## 16.3 Affected Environment

Several streams in the floodplain impact analysis area convey stormwater runoff, but not all of these washes, creeks, and rivers have a regulatory (defined) floodplain boundary. For the purpose of identifying streams and floodplains, the floodplain impact analysis area is described from north to south and is divided into the two counties crossed by the MVC study area. Information was gathered from a variety of sources including FEMA's Community Status Book, flood insurance rate maps, and digital (Q3) flood data; U.S. Geological Survey topographic maps; Salt Lake County digital floodplain data and the Southwest Canal and Creek Study (Salt Lake County 2003); and the City of West Jordan Master Drainage Study (City of West Jordan 2003).

### 16.3.1 Resource Identification Methods

To evaluate the affected environment, an inventory of the streams in the floodplain impact analysis area was developed. Because FEMA's flood insurance program and flood hazard data are organized by local (city and county) jurisdictions, the first step in creating the stream inventory was to identify the communities in the impact analysis area. Next, streams and water bodies within the affected communities were identified. Note that, in this chapter, *stream* is used as a general term to describe waterways such as rivers, creeks, canals, and washes. These waterways can be perennial (containing water year-round) or intermittent (wet only part of the year).

The primary sources of data used to develop the stream inventory are FEMA flood insurance rate maps, U.S. Geological Survey topographic maps, and information from local governments. The inventory includes some streams that do not have a regulatory floodplain (that is, a floodplain shown on a FEMA flood insurance rate map). However, canals are included in the inventory only if they have a regulatory floodplain.

### 16.3.2 Salt Lake County

The floodplain impact analysis area includes parts of several communities in Salt Lake County as well as unincorporated areas of the county. These communities participate in FEMA's National Flood Insurance Program and are listed in Table 16.3-1.

**Table 16.3-1. Communities Participating in the FEMA Flood Insurance Program in the Floodplain Impact Analysis Area – Salt Lake County**

Community	FEMA Community Number (CID)
Salt Lake County	490102
Salt Lake City	490105
West Valley City	490245
Taylorsville	490248
West Jordan	490108
South Jordan	490107
Herriman	490252
Riverton	490104
Bluffdale	490247
Draper	490244
Source: FEMA 2005	

The National Flood Insurance Program requires participating communities to enact ordinances that protect the natural floodplain environment, prevent damage to property, and protect public safety. The floodplains in the Salt Lake County portion of the floodplain impact analysis area receive precipitation and snowmelt runoff primarily from the Oquirrh Mountains, which are west of the impact analysis area. Streams in the Salt Lake County portion of the floodplain impact analysis area are described below and summarized in Table 16.3-2 below. In the descriptions, references to Salt Lake County indicate that the stream runs through one or more unincorporated portions of the county. Left and right banks are designated as if one were looking downstream. These streams are also shown in Figure 16-3 to Figure 16-4, Floodplains.

**Surplus Canal.** The Surplus Canal originates at the Jordan River near 2100 South in Salt Lake City and runs generally northwest to the Great Salt Lake.

**Lee Creek.** Lee Creek crosses portions of West Valley City and Salt Lake City. It is a shallow natural drainage channel with limited capacity and conveys stormwater runoff and excess irrigation water.

**Table 16.3-2. Streams in the Impact Analysis Area – Salt Lake County**

Stream	Description
Surplus Canal	Drains northwest from the Jordan River to the Great Salt Lake, passing the south and west sides of the Salt Lake City International Airport.
Lee Creek	Originates in the floodplain impact analysis area south of State Route (SR) 201. Runs northwest to Interstate 80 (I-80).
Coon and Harker's Canyon Creeks	These creeks join east of 8400 West. The floodplains run north-south between about 3500 South and 5400 South.
Dry Wash	Located north of 7800 South, the intermittent stream runs generally northwest to southeast.
Clay Hollow Drainage	Runs generally west to east near 7800 South. Clay Hollow Drainage is a left-bank tributary to Barney's Creek; the confluence is located east of 5600 West.
Unnamed Creek	Runs generally west to east near 8200 South. Unnamed Creek is a left-bank tributary to Barney's Creek; the confluence is located west of 5600 West.
Barney's Creek	The floodplain runs generally from southwest to northeast, crossing 5600 West at about 8200 South and terminating to the east of the Salt Lake City Municipal Airport (also called Airport No. 2).
Barney's Wash	The floodplain parallels the New Bingham Highway to 5600 West.
Bingham Creek	The floodplain begins in the west at about 10400 South and parallels Old Bingham Highway to about 9000 South.
Midas Creek	The stream runs west to east through Salt Lake County, Herriman, and Riverton, exiting the floodplain impact analysis area between 11800 South and 12600 South.
Copper Creek	The stream, a right-bank tributary to Midas Creek, runs west to east through Salt Lake County and Herriman.
Butterfield Creek	The floodplain generally parallels 12600 South and the Midas Creek floodplain west to east across the floodplain impact analysis area. However, the floodplain is not continuous.
Rose Creek	Rose Creek flows east through Herriman and Salt Lake County and exits the floodplain impact analysis area near 13400 South and Bangerter Highway.
Juniper Canyon Drainage	Juniper Canyon Drainage originates in the Traverse Mountains and flows to the northeast through Herriman and Bluffdale.
Wood Hollow Drainage	Wood Hollow Drainage originates in the Traverse Mountains and runs generally west to east. Its regulatory floodplain begins in Bluffdale and runs northeasterly, terminating at Redwood Road.
Beef Hollow Drainage	Beef Hollow Drainage flows primarily in an easterly direction from the Traverse Mountains to the Jordan River near Camp Williams.
Jordan River	From the Salt Lake County–Utah County line, the Jordan River flows generally northward through Bluffdale between Redwood Road and Interstate 15 (I-15), exiting the impact analysis area near Bangerter Highway.
Sources: FEMA 2001, 2002; Salt Lake County 2001; Utah AGRC 2005	

***Coon and Harker's Canyon Creeks.*** Coon and Harker's Canyon Creeks are located in West Valley City and Salt Lake County. The streams run generally to the north toward the Utah and Salt Lake Canal.

***Dry Wash.*** Dry Wash is located in West Jordan and is dry almost 9 months of the year. It is a natural V-shaped channel that conveys local stormwater runoff.

***Clay Hollow Drainage.*** Clay Hollow Drainage originates in the Oquirrh Mountains and is located in Salt Lake County and West Jordan. It is a natural V-shaped channel and is dry about 7 to 9 months of each year.

***Unnamed Creek.*** Located in West Jordan, Unnamed Creek is an intermittent, left-bank tributary to Barney's Creek.

***Barney's Creek.*** Barney's Creek originates in the Oquirrh Mountains and is located in Salt Lake County and West Jordan. The stream is intermittent and flows in response to rainfall or snowmelt. It also conveys excess irrigation flows.

***Barney's Wash.*** Barney's Wash is located in Salt Lake County and West Jordan. In undeveloped areas, the wash is a well-defined V-shaped channel. In developed areas, discharges are conveyed by a storm drain system.

***Bingham Creek.*** Bingham Creek traverses Salt Lake County, South Jordan, and West Jordan. Like nearby streams, Bingham Creek is dry most of the year and conveys discharges associated with rainfall and snowmelt and excess irrigation water. The channel has a natural V shape; however, portions have been dredged and enlarged by Kennecott Development as part of an effort to clean up lead and arsenic contamination.

***Midas Creek.*** An intermittent stream, Midas Creek runs through Salt Lake County, Herriman, Riverton, and South Jordan. Its channel has a V shape and limited capacity due to deposited debris.

***Copper Creek.*** Copper Creek is an intermittent, right-bank tributary to Midas Creek and is located in Salt Lake County and Herriman.

***Butterfield Creek.*** Butterfield Creek originates in the Oquirrh Mountains. Its historic channel runs through Salt Lake County, Herriman, Riverton, and South Jordan. The stream has been diverted to Midas Creek upstream of the Riverton city limits. However, regulatory floodplains remain on downstream portions of Butterfield Creek.

***Rose Creek.*** Originating in the Oquirrh Mountains, Rose Creek runs through Salt Lake County, Herriman, and Riverton. The stream's natural V-shaped channel conveys water from rainfall, snowmelt, and excess irrigation water 3 to 4 months each year.



***Juniper Canyon Drainage.*** Juniper Canyon Drainage originates in the Traverse Mountains and is located in Herriman and Bluffdale. The natural V-shaped channel conveys seasonal runoff and is typically dry for half of each year.

***Wood Hollow Drainage.*** Located in southern Salt Lake County and Bluffdale, Wood Hollow Drainage is an intermittent stream that originates in the Traverse Mountains. In steep areas, the channel is well-defined and V-shaped; as slopes become more shallow, the channel is wider and more shallow.

***Beef Hollow Drainage.*** Originating in the Traverse Mountains, Beef Hollow Drainage runs through southern Salt Lake County and Bluffdale to the Jordan River. It is a well-defined channel with a natural V-shaped channel and is typically dry for half of each year.

***Jordan River.*** The Jordan River is the largest drainage channel in the Salt Lake Valley. The Jordan River extends for about 58 miles from the outlet of Utah Lake north to the Great Salt Lake, which is a terminal basin in northern Salt Lake County. The Jordan River watershed includes all land that drains into the Jordan River from the Jordan River Narrows (located at the Salt Lake County–Utah County line between Redwood Road and I-15) northward to where the river empties into the Great Salt Lake. From the Jordan River Narrows, the river meanders north through the floodplain impact analysis area, passing Bluffdale and the Utah State Prison before crossing Bangerter Highway and exiting the impact analysis area. Because few tributaries join the Jordan River in this portion of the impact analysis area, the conditions of Utah Lake and its watershed control the Jordan River’s flow rates and flooding.





### 16.3.3 Utah County

The floodplain impact analysis area includes portions of a number of communities in Utah County as well as unincorporated areas of the county. These communities are listed in Table 16.3-3.

**Table 16.3-3. Communities Participating in the FEMA Flood Insurance Program in the Floodplain Impact Analysis Area – Utah County**

Community	FEMA Community Number (CID)
Utah County	495517
Eagle Mountain	NA <sup>a</sup>
Saratoga Springs	490250
Lehi	490209
American Fork	490152
Pleasant Grove	490235
Lindon	490210

<sup>a</sup> Not applicable. Eagle Mountain is not listed as a participating community in the source for this table. There are no streams or water bodies in Eagle Mountain to be included in the floodplain impact analysis.

Source: FEMA 2005

The streams and water bodies in the Utah County portion of the floodplain impact analysis area are described below and summarized in Table 16.3-4 below. In the descriptions, references to Utah County indicate that the stream runs through one or more unincorporated portions of the county. These streams and water bodies are also shown in Figure 16-5 through Figure 16-7, Floodplains.

**Table 16.3-4. Streams and Water Bodies in the Floodplain Impact Analysis Area – Utah County**

Stream/ Water Body	Description
Jordan River	The Jordan River segment south of the Salt Lake County–Utah County line is considered part of the Utah Lake watershed. The floodplain begins in Saratoga Springs, meanders north through Lehi, and turns to flow northwest to the Jordan River Narrows.
Utah Lake	The Utah Lake floodplain extends from Saratoga Springs on the northwest shore of Utah Lake near the Jordan River outlet along the north shore of the lake and the southernmost portion of the floodplain impact analysis area southeast to Lindon. The Utah Lake floodplain extends northward at the mouth of American Fork River and, to a lesser extent, at the mouth of Spring Creek.
Dry Creek	This creek originates in the Traverse Mountains. The floodplain enters the analysis area at I-15 and about 1200 North in Lehi, runs southwest, and terminates at about 200 North. The stream continues to Utah Lake but has no defined 100-year floodplain for the downstream reach.
Spring Creek	Spring Creek enters the analysis area near I-15 south of Main Street in Lehi. Its flows are attenuated by Mill Pond. Spring Creek has no regulatory floodplain within the analysis area; however, the Utah Lake floodplain extends northward along the stream near the mouth.
American Fork River	The American Fork River enters the analysis area near I-15 and 400 South (in American Fork). South of I-15, the only regulatory floodplain along the American Fork River is at its mouth.
Sources: FEMA 2001, 2002; Salt Lake County 2001; Utah AGRC 2005	

**Jordan River.** The Jordan River is located in both Salt Lake and Utah Counties and is described in Section 16.3.2, Salt Lake County. Impacts associated with the Jordan River floodplain are addressed under impacts from the Utah County alternatives (see Section 16.4.4, Utah County Alternatives).

**Utah Lake.** At about 96,600 acres, Utah Lake is the largest freshwater lake in Utah. The Provo, Spanish Fork, and American Fork Rivers are the primary tributaries to Utah Lake. Utah Lake is critical to farming in the Salt Lake Valley with several canal companies diverting water from the lake or, under low water conditions, from the Jordan River at the pumping station in Lehi.

In 1885, Utah County and Salt Lake County reached a compromise agreement regarding Utah Lake water use. The agreement was amended in 1986 after several high-precipitation years caused flooding around the lake, and a new compromise lake level of 4,489.0455 feet was established (Hooton 2001). This lake level ensures adequate flows in the diversion canals at the northwestern shoreline and protects the surrounding areas from flooding. Utah Lake's surface elevation is also controlled by the upstream reservoirs.

FEMA-issued maps and associated documents show the 100-year flood elevation of the northern shoreline of Utah Lake at 4,495 feet (FEMA 2002). The Utah

Lake floodplain extends from Saratoga Springs on the northwest shore of Utah Lake near the Jordan River outlet along the north shore of the lake and the southern boundary of the floodplain impact analysis area southeast to Lindon.

***Dry Creek.*** Originating in the Traverse Mountains, Dry Creek runs through Utah County, Alpine, Highland, and Lehi, ultimately discharging into Utah Lake. Dry Creek Dam limits downstream flows; the lower reach conveys seasonal stormwater runoff and excess irrigation water.

***Spring Creek.*** Spring Creek originates in American Fork and drains portions of Utah County and Lehi before entering Utah Lake. The stream conveys natural spring water and is used for irrigation.

***American Fork River.*** The American Fork River runs through Utah County, Highland, and American Fork as it flows from the Wasatch Mountains to Utah Lake. It has a natural V-shaped channel and is used for irrigation during summer months, which limits the river's downstream flow.

## 16.4 Environmental Consequences

### 16.4.1 Methodology

Impacts from the action alternatives were determined by comparing flood insurance rate maps to the right-of-way of the various alternatives to identify transverse or longitudinal crossings of the streams and water bodies in the floodplain impact analysis area. As with the discussion of the affected environment, the discussion of environmental consequences groups the alternatives by county.

When reviewing the floodplain impacts described in this section, readers should take the following factors into consideration:

- Some streams are located in the floodplain impact analysis area but do not intersect a particular alternative alignment.
- A regulatory floodplain can be defined for all of, part of, or no portion of a stream.
- Different reaches of the same stream can have different flood zone designations (for example, part of a stream can have a Zone A designation while another part can have a Zone AE designation).
- Structures such as bridges or culverts already exist at some locations. These structures would need to be replaced or modified, but these changes would not create a new floodplain crossing.

- Crossing lengths across the regulatory floodplains and acreages of floodplain areas affected can be calculated only for streams with regulatory floodplains, so readers should be aware that impact totals do not include impacts to streams that do not have a regulatory floodplain.
- Designing new bridges and culverts for an appropriate stormwater event would reduce floodplain impacts. These hydraulic structures would be designed to meet the more stringent of Utah Department of Transportation (UDOT) or FEMA requirements (where applicable). According to UDOT standards, culverts and bridges for freeways would be designed to accommodate a 50-year or greater magnitude flood (one with a 2% annual chance of occurring) where no regulatory floodplain is defined. Similarly, culverts and bridges along principal arterials would be designed to accommodate a 25-year or greater magnitude flood (one with a 4% annual chance of occurring) where no regulatory floodplain is defined. There is a regulatory floodplain at the locations of many proposed structures. To satisfy FEMA requirements, these culverts and bridges would be designed to accommodate a 100-year flood (one with a 1% annual chance of occurring).

Floodplain impacts associated with the various alternatives were determined using a geographic information system (GIS) approach. Digital stream data, floodplain mapping, and the alternative impact area were compared to determine the number of stream crossings and to determine whether these crossings are transverse or longitudinal. Transverse crossings are crossings that are perpendicular or nearly perpendicular to the direction of stream flow. Longitudinal crossings are crossings that are parallel or nearly parallel to a stream or the edge of a lake. Existing crossings are included in the total number of crossings that would result from each alternative.

For crossings of streams with regulatory floodplains, both the crossing length and the floodplain area affected were quantified. Crossing lengths were measured from edge of floodplain to edge of floodplain along the approximate centerline of the proposed alignment. Some of the crossings associated with the 5600 West Transit Alternative are existing; for these crossings, quantified floodplain area impacts were limited to strip takes (narrow strips of additional right-of-way).

For the floodplain evaluation, effective dates for flood insurance rate maps within the impact analysis area were determined. The Salt Lake County flood insurance rate maps used for the analysis are dated September 21, 2001. Salt Lake County floodplain data were obtained in a digital format from the county's Public Works Department. The Utah County flood insurance rate maps used for the analysis are dated July 17, 2002. The Utah County data were not readily available in a digital

format, and a visual comparison between current maps and 1996 digital floodplain (Q3) data showed differences in the Jordan River and Utah Lake floodplains. Therefore, 2002 flood insurance rate maps were georeferenced, and floodplains were digitized. Although minor imperfections are inherent in the georeferencing and digitizing process, the quantified impacts are more accurate than those that could have been obtained from the 1996 digital floodplain data.

#### **16.4.2 No-Action Alternative**

Under the No-Action Alternative, the MVC project would not be constructed, so no impacts to floodplains would occur as a result of the MVC project. Other transportation projects identified in the Wasatch Front Regional Council and Mountainland Association of Governments long-range plans and by the local communities would be constructed, and these projects could cause impacts to floodplains. However, local floodplain regulations would be followed, and these regulations would minimize impacts.

#### **16.4.3 Salt Lake County Alternatives**

In Salt Lake County, two roadway alternatives and a transit alternative which would be implemented as part of the roadway alternatives are under consideration: the 5600 West Transit Alternative, the 5800 West Freeway Alternative, and the 7200 West Freeway Alternative. Under the 5600 West Transit Alternative, there is a dedicated right-of-way (ROW) option and a mixed-traffic option. In addition, a tolling option was considered for each freeway alternative.

The regulatory floodplains defined near the Salt Lake County alternative alignments all have Zone A designations. Table 16.4-1 and Table 16.4-2 below provide a summary of the floodplain impacts from the Salt Lake County alternatives. Impacts under each combination of alternatives and options are discussed in the following sections.

▲ ▲

Table 16.4-1. Floodplain Crossings – Salt Lake County

Stream/ Water Body	FEMA Zone <sup>b</sup>	Crossings by Alternative <sup>a</sup>			
		5600 West Transit – Dedicated ROW	5600 West Transit – Mixed Traffic	5800 West	7200 West
Surplus Canal	A	T	T	—	—
Lee Creek	A	—	—	T <sup>c</sup>	T
Coon and Harker's Canyon Creeks	A	—	—	—	—
Dry Wash	None	—	—	T	T
Clay Hollow Drainage	A	T	T	T	T
Unnamed Creek	A	—	—	T	T
Barneys Creek	A	T	T	T	T
Barneys Wash	A	T	T	T	T
Bingham Creek	A	T	T	T	T
Midas Creek	A <sup>d</sup>	T	T	T	T
Copper Creek	A	T	T	—	—
Butterfield Creek	A <sup>e</sup>	—	—	—	—
Rose Creek	A	—	—	T	T
Juniper Canyon Drainage	None	—	—	T	T
Wood Hollow Drainage	A	—	—	T	T
Beef Hollow Drainage	None	—	—	T	T
<b>Total crossings</b>		<b>7 T</b>	<b>7 T</b>	<b>12 T</b>	<b>12 T</b>

<sup>a</sup> T = Transverse (crosses MVC alternative).<sup>b</sup> FEMA Zone: A = No base flood elevations determined.<sup>c</sup> Transverse crossing not located on main roadway; rather on 2100 South intersection footprint.<sup>d</sup> Regulatory floodplain (Zone A) is defined near the 5800 West and 7200 West Freeway Alternatives crossing but is not defined near either of the 5600 West Transit Alternative options.<sup>e</sup> Streams and regulatory floodplains are not continuous; they are shown upstream and downstream of the alternative alignments, but not adjacent to the alignments.

Sources: FEMA 2001, 2002

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**Table 16.4-2. Floodplain Impact Summary – Salt Lake County**

Impact Description	Alternative			
	5600 West Transit – Dedicated ROW	5600 West Transit – Mixed Traffic	5800 West Freeway	7200 West Freeway
<i>Total Number of Crossings</i>				
Longitudinal	0	0	0	0
Transverse	7	7	12	12
<i>Total Length of Crossings (in feet)<sup>a,b</sup></i>				
Longitudinal	0	0	0	0
Transverse	1,100	1,100	2,300	2,500
Total	1,100	1,100	2,300	2,500
<i>Total Floodplain Impacts (in acres)<sup>a,c</sup></i>				
Area	3	3	24	29

<sup>a</sup> Values reflect only streams with regulatory floodplains.

<sup>b</sup> Crossing lengths are rounded to the nearest 100 feet; totals might be different due to rounding.

<sup>c</sup> Floodplain impact areas are rounded to the nearest acre.

### 16.4.3.1 5600 West Transit Alternative

As described in Chapter 2,

Alternatives, two transit options are under consideration along 5600 West in Salt Lake County. One option, the Dedicated Right-of-Way Option,

would incorporate a transit system

running down the center of the roadway, and the other, the Mixed-Traffic Option, would incorporate a transit system running alongside the roadway. The floodplain impacts of each option are discussed in the following sections.

#### 5600 West Transit Alternative with Dedicated Right-of-Way Transit Option

Most of the streams in the Salt Lake County portion of the impact analysis area flow from west to east near the alternatives. The alternative alignments, including the 5600 West Transit Alternative with Dedicated Right-of-Way Transit Option, run generally north to south and therefore result in transverse crossings of the streams. The Dedicated Right-of-Way Transit Option would result in seven

5600 West Transit Alternative Impacts	
Total number of crossings (longitudinal)	0
Total number of crossings (transverse)	7
Total length of crossings (feet)	1,100
Total floodplain impacts (acres)	3

transverse stream crossings. Each of the seven streams has a regulatory floodplain.

There are several roads along portions of 5600 West, so drainage structures already exist for some of the identified crossings. Specifically, there are structures at three streams: Clay Hollow Drainage, Barney's Creek, and Barney's Wash. If these existing structures are modified or replaced, the modified or new structures would meet or exceed the existing hydraulic capacity and therefore would not cause any negative floodplain impacts.

New structures would be required for crossings of four streams: Surplus Canal, Bingham Creek, Midas Creek, and Copper Creek. When new hydraulic structures are designed, the UDOT Manual of Instruction – Roadway Drainage (UDOT 2005) would be used to determine the design flood. According to the Manual of Instruction, the design storm should not result in an increased flood hazard for adjoining properties and should not overtop the roadway. Culverts and bridges for freeways would be designed to accommodate a 50-year or greater magnitude flood (one with a 2% annual chance of occurring). Culverts and bridges along principal arterials would be designed to accommodate a 25-year or greater magnitude flood (one with a 4% annual chance of occurring). There is a regulatory floodplain at the locations of many proposed structures; this would require designing culverts and bridges to accommodate a 100-year flood (one with a 1% annual chance of occurring). Furthermore, design would satisfy FEMA requirements and local floodplain ordinances.

The total regulatory floodplain crossing length of the seven transverse crossings would be about 1,100 feet. Floodplain area impacts would be limited due to existing roads along portions of 5600 West; the seven crossings would affect about 3 acres.

Floodplain impacts from this option would be minor because bridges and culverts would meet the design standards in the Manual of Instruction and because FEMA requirements and local floodplain ordinances would be followed. Though the alignment in this area would have a small (4% or less) annual chance of flooding, such flooding would not create a significant potential for interfering with a transportation facility needed for emergency vehicles or evacuation. Any flooding along the identified streams in Salt Lake County would likely be localized, and the existing roadway network would provide alternate evacuation routes. Bridges and culverts would meet UDOT and FEMA requirements, which would reduce the chance of upstream flooding. The streams crossed by the alternative are generally small (in terms of known peak discharges) and intermittent. The alternative would not result in a significant adverse impact on natural and beneficial floodplain values.



In summary, the Dedicated Right-of-Way Transit Option would not result in either a significant potential for interfering with a transportation facility needed for emergency vehicles or evacuation or a significant risk of upstream flooding. Furthermore, impacts to natural and beneficial floodplain values would not be significant.

### **5600 West Transit Alternative with Mixed-Traffic Transit Option**

Though the right-of-way requirements are different for the Mixed-Traffic Transit Option and the Dedicated Right-of-Way Transit Option, the two options have identical alignments. Therefore the number, nature, and impacts to stream crossings from the Mixed-Traffic Transit Option would be similar to those from the Dedicated Right-of-Way Transit Option. The Mixed-Traffic Transit Option would require seven transverse floodplain crossings. The total regulatory floodplain crossing length would be 1,100 feet, and a total of 3 acres of regulatory floodplain would be affected. As with the Dedicated Right-of-Way Transit Option, no significant encroachment would result from the Mixed-Traffic Transit Option.

#### **16.4.3.2 5800 West Freeway Alternative**

As described in Chapter 2, Alternatives, this alternative would consist of a freeway extending from I-80 to the Utah County line. The 5800 West Freeway Alternative

<b>5800 West Freeway Alternative Impacts</b>	
Total number of crossings (longitudinal)	0
Total number of crossings (transverse)	12
Total length of crossings (feet)	2,300
Total floodplain impacts (acres)	24

would result in 12 transverse stream crossings: Lee Creek, Dry Wash, Clay Hollow Drainage, Unnamed Creek, Barney's Creek, Barney's Wash, Bingham Creek, Midas Creek, Rose Creek, Juniper Canyon Drainage, Wood Hollow Drainage, and Beef Hollow Drainage. Of these crossings, only two have existing drainage structures (Lee Creek and Rose Creek). All of the crossings have regulatory floodplains except three: Dry Wash, Juniper Canyon Drainage, and Beef Hollow Drainage. The total regulatory floodplain crossing length would be 2,300 feet, and a total of 24 acres of regulatory floodplain would be affected.

When new hydraulic structures are designed, the Manual of Instruction would be used to determine the design flood. A 50-year or greater magnitude flood (one with a 2% annual chance of occurring) would be used to design freeway bridges and culverts. Furthermore, design would satisfy FEMA requirements and local floodplain ordinances. If any structures are reused, their structural integrity and hydraulic capacity would be verified during the design phase of the project.



Floodplain impacts from this alternative would be minor because bridges and culverts would meet the design standards in the Manual of Instruction and because FEMA requirements and local floodplain ordinances would be followed. As described in Section 16.4.3.1, 5600 West Transit Alternative, a 2% (or less) annual chance of flooding is not considered significant, and designing bridges and culverts to pass the appropriate flood would reduce impacts to the transportation facility and the risk of upstream flooding. The 5800 West Freeway Alternative would not result in either a significant potential for interfering with a transportation facility needed for emergency vehicles or evacuation or a significant risk of upstream flooding. The streams crossed by the alternative are generally small (in terms of known peak discharges) and intermittent. The alternative would not result in a significant adverse impact on natural and beneficial floodplain values.

**Combined Impacts of 5800 West Freeway and 5600 West Transit Alternatives**

The 5800 West Freeway Alternative would be implemented with one of the two 5600 West Transit Alternative options.

***5800 West Freeway Alternative with Dedicated Right-of-Way Transit Option***

Combined Impacts of 5800 West Freeway and 5600 West Transit Alternatives	
Total number of crossings (longitudinal)	0
Total number of crossings (transverse)	19
Total length of crossings (feet)	3,400
Total floodplain impacts (acres)	27

The 5800 West Freeway Alternative would result in 12 transverse crossings with a total regulatory floodplain crossing length of 2,300 feet. These crossings would affect 24 acres of regulatory floodplain. The 5600 West Transit Alternative with Dedicated Right-of-Way Transit Option would result in seven transverse stream crossings with a total length of 1,100 feet. These seven crossings would affect about 3 acres of regulatory floodplain. The combined impacts of the 5800 West Freeway Alternative with Dedicated Right-of-Way Transit Option would include 19 transverse crossings, a total regulatory floodplain crossing length of 3,400 feet, and 27 acres of regulatory floodplain affected. Combined, these alternatives would not result in a significant potential for interfering with a transportation facility needed for emergency vehicles or evacuation, a significant risk of upstream flooding, or a significant adverse impact on natural and beneficial floodplain values.



### ***5800 West Freeway Alternative with Mixed-Traffic Transit Option***

The floodplain impacts from the combined 5800 West Freeway Alternative with Mixed-Traffic Transit Option would be nearly identical to the combined impacts of the 5800 West Freeway Alternative with Dedicated Right-of-Way Transit Option. The two transit options have the same alignment. Right-of-way requirements vary slightly, but either transit option would result in 3 acres of floodplain impacts.

### **5800 West Freeway Alternative with Tolling Option**

Under the 5800 West Freeway Alternative with Tolling Option, the overall facility design would not change compared to the non-tolled alternative, so impacts to floodplains would be the same as those from the 5800 West Freeway Alternative.

#### **16.4.3.3 7200 West Freeway Alternative**

As described in Chapter 2, Alternatives, this alternative would consist of a freeway extending from I-80 to the Utah County line. The 7200 West Freeway Alternative would result in the transverse

<b>7200 West Freeway Alternative Impacts</b>	
Total number of crossings (longitudinal)	0
Total number of crossings (transverse)	12
Total length of crossings (feet)	2,500
Total floodplain impacts (acres)	29

crossing of the same 12 streams identified for the 5800 West Freeway Alternative. Of these crossings, one crossing would be existing and would require replacement or modification of the hydraulic structure. All of the crossings have regulatory floodplains except three: Dry Wash, Juniper Canyon Drainage, and Beef Hollow Drainage. The total regulatory floodplain crossing length would be 2,500 feet, and 29 acres of regulatory floodplain would be affected.

When new hydraulic structures are designed, the Manual of Instruction would be used to determine the design flood. A 50-year or greater magnitude flood (one with a 2% annual chance of occurring) would be used to design freeway bridges and culverts. Furthermore, design would satisfy FEMA requirements and local floodplain ordinances. If any structures are reused, their structural integrity and hydraulic capacity would be verified during the design phase.

Floodplain impacts from this alternative would be minor because bridges and culverts would be meet the design standards in the Manual of Instruction and because FEMA requirements and local floodplain ordinances would be followed. As described in Section 16.4.3.1, 5600 West Transit Alternative, a 2% (or less)

annual chance of flooding is not considered significant, and designing bridges and culverts to pass the appropriate flood would reduce impacts to the transportation facility and the risk of upstream flooding. The 7200 West Freeway Alternative would not result in either a significant potential for interfering with a transportation facility needed for emergency vehicles or evacuation or a significant risk of upstream flooding. The streams crossed by the alternative are generally small (in terms of known peak discharges) and intermittent. The alternative would not result in a significant adverse impact on natural and beneficial floodplain values.

### **Combined Impacts of 7200 West Freeway and 5600 West Transit Alternatives**

As with the 5800 West Freeway Alternative, the 7200 West Freeway Alternative would be implemented with one of the two 5600 West Transit Alternative options.

<b>Combined Impacts of 7200 West Freeway and 5600 West Transit Alternatives</b>	
Total number of crossings (longitudinal)	0
Total number of crossings (transverse)	19
Total length of crossings (feet)	3,600
Total floodplain impacts (acres)	32

#### ***7200 West Freeway Alternative with Dedicated Right-of-Way Transit Option***

The number of crossings and floodplain impacts associated with the 7200 West Freeway and 5600 West Transit Alternatives are shown above in Table 16.4-1, Floodplain Crossings – Salt Lake County, and Table 16.4-2, Floodplain Impact Summary – Salt Lake County. The 7200 West Freeway Alternative would result in 12 transverse stream crossings with a total regulatory floodplain crossing length of 2,500 feet. These crossings would affect a total of 29 acres of regulatory floodplain. The 5600 West Transit Alternative with Dedicated Right-of-Way Transit Option would result in seven crossings with a total crossing length of 1,100 feet and would affect a total of 3 acres of regulatory floodplain. The combined impacts of the 7200 West Freeway Alternative with Dedicated Right-of-Way Option would include 19 transverse crossings, a total crossing length of 3,600 feet, and 32 acres of regulatory floodplain affected. Combined, these alternatives would not result in a significant potential for interfering with a transportation facility needed for emergency vehicles or evacuation, a significant risk of upstream flooding, or a significant adverse impact on natural and beneficial floodplain values.

### ***7200 West Freeway Alternative with Mixed-Traffic Transit Option***

The floodplain impacts of the combined 7200 West Freeway Alternative with Mixed-Traffic Transit Option would be the same as the combined impacts of the 7200 West Freeway Alternative with Dedicated Right-of-Way Transit Option.

### **7200 West Freeway Alternative with Tolling Option**

Under the 7200 West Freeway Alternative with Tolling Option, the overall facility design would not change compared to the non-tolled alternative, so impacts to floodplains would be the same as those from the 7200 West Freeway Alternative.

## **16.4.4 Utah County Alternatives**

In Utah County, three alternatives are under consideration: the Southern Freeway Alternative, the 2100 North Freeway Alternative, and the Arterials Alternative. In addition, a tolling option was evaluated for each Utah County alternative. Impacts under each combination of alternatives and options are discussed in the following sections.

Three types of regulatory floodplains are defined near the Utah County alternatives. The Jordan River and Utah Lake have a Zone AE designation. Shallow ponding areas in the right (east) overbank of the Jordan River have a Zone AH designation, and a Zone A floodplain is located in the left (west) overbank area near Utah Lake. At the mouth of the American Fork River, a Zone A floodplain is defined. Dry Creek and Spring Creek have no regulatory floodplains defined near the Utah County alternatives.

Analyzing floodplain impacts from the Utah County alternatives is more complicated than analyzing floodplain impacts from the Salt Lake County alternatives because of two factors. First, there are shallow ponding areas (Zone AH) north of Utah Lake and east of the Jordan River. The ponding areas are oriented north-south, and the roadway crossings are transverse. However, the crossings are relatively wide compared to crossings of Zone A or Zone AE floodplains. Furthermore, a roadway might cross a ponding area more than once due to the irregular shape of the ponding area.

Second, longitudinal floodplain impacts are associated with Utah Lake. The Utah Lake floodplain boundary is not uniform, and some alignments cross the floodplain multiple times. The number of longitudinal crossings is determined for each alternative and option; however, crossing lengths vary from less than 600 feet to more than 6,000 feet. For both transverse and longitudinal crossings, the number of crossings can be deceiving. The floodplain area affected by all crossings has been quantified and better reflects the floodplain impacts from each alternative.

All of the hydraulic structures (bridges and culverts) required by the alternatives would be located at new crossing locations with the exception of 1900 South on Dry Creek. The structure at this location would need to be replaced or modified.

Table 16.4-3 and Table 16.4-4 below provide a summary of the floodplain impacts from the Utah County alternatives. Impacts under each combination of alternatives and options are discussed in the following sections.

**Table 16.4-3. Floodplain Crossings – Utah County**

Stream/ Water Body	FEMA Zone <sup>a</sup>	Crossings by Alternative <sup>b</sup>		
		Southern Freeway	2100 North Freeway	Arterials
Jordan River	A/AE/AH	2T <sup>c</sup>	1T	4T <sup>c</sup>
Utah Lake	AE	3L	—	3L
Dry Creek	None <sup>d</sup>	1T	—	1T
Spring Creek	None	1T	—	1T
American Fork River	A	1T	—	1T
<b>Total crossings</b>		<b>5T / 3L</b>	<b>1T</b>	<b>7T / 3L</b>

<sup>a</sup> FEMA Zones: A = No base flood elevations determined. AE = Base flood elevations determined. AH = Flood depths of 1 foot to 3 feet (usually areas of ponding); base flood elevations determined.

<sup>b</sup> L = Longitudinal, T = Transverse; number of crossings precedes letter.

<sup>c</sup> Number of crossings includes two at Southern Freeway or 1900 South: one at the river and one in the nearby shallow flooding (AH) zone.

<sup>d</sup> A regulatory floodplain is not defined on Dry Creek near alternative crossings; however, an AE Zone is defined farther upstream in Lehi.

Source: FEMA 2002

**Table 16.4-4. Floodplain Impact Summary – Utah County**

Impact Description	Alternative		
	Southern Freeway	2100 North Freeway	Arterials
<i>Total Number of Crossings</i>			
Longitudinal	3	0	3
Transverse	5	1	7
<i>Total Length of Crossings (in feet)<sup>a,b</sup></i>			
Longitudinal	10,100	0	9,000
Transverse	6,600	1,000	8,700
Total	16,700	1,000	17,600
<i>Total Floodplain Impacts (in acres)<sup>a,c</sup></i>			
Area	116	11	90

<sup>a</sup> Values reflect only streams with regulatory floodplains.

<sup>b</sup> Crossing lengths are rounded to the nearest 100 feet; totals might be different due to rounding.

<sup>c</sup> Floodplain impact areas are rounded to the nearest acre.

### 16.4.4.1 Southern Freeway Alternative

As described in Chapter 2, Alternatives, this alternative would consist of a freeway extending from the Utah County line to I-15 at Lindon. The floodplain impacts that would result from this alternative are discussed below.

Southern Freeway Alternative Impacts	
Total number of crossings (longitudinal)	3
Total number of crossings (transverse)	5
Total length of crossings (feet)	16,700
Total floodplain impacts (acres)	116

The Southern Freeway Alternative would result in five transverse crossings: Jordan River (one at the river and one in the nearby shallow flooding zone), Dry Creek, Spring Creek, and American Fork River. The Southern Freeway Alternative would also result in three longitudinal crossings of the Utah Lake floodplain. The total length of the transverse and longitudinal crossings would be 16,700 feet, and 116 acres of floodplain would be affected.

When new hydraulic structures are designed, the Manual of Instruction would be used to determine the design flood. A 50-year or greater magnitude flood (one with a 2% annual chance of occurring) would be used to design freeway bridges and culverts. There is a regulatory floodplain at the locations of many proposed structures; this would require designing culverts and bridges to accommodate a 100-year flood (one with a 1% annual chance of occurring). Furthermore, design would satisfy FEMA requirements and local floodplain ordinances. If any structure is reused, its structural integrity and hydraulic capacity would be verified during the design phase of the project.

Floodplain impacts from this alternative would be minor because bridges and culverts would meet the design standards in the Manual of Instruction and because FEMA requirements and local floodplain ordinances would be followed. A 2% (or less) annual chance of flooding would not result in a significant potential for interfering with a transportation facility needed for emergency vehicles or evacuation. Northern Utah County residents would have three north-south evacuation routes: SR 68 (Redwood Road), I-15, and the Mountain View Corridor. Bridges and culverts would be designed to pass the appropriate flood, so the risk of upstream flooding is expected to be minor.

Floodplain impacts would be limited to the project footprint, and hydraulic connections to Utah Lake floodplains north of the alternative would be maintained as discussed in Section 16.4.5, Mitigation Measures. The alternative alignment is along the northern edge of the Utah Lake floodplain, so there is a limited floodplain area on the north side of the alignment. Maintaining hydraulic connections would reduce impacts to natural and beneficial floodplain values,



specifically flood conveyance (for flood waters moving toward the lake) and flood storage (for flood waters creeping northward as the lake level rises). The hydraulic connections would also reduce impacts to groundwater recharge, as surface water from the north would be able to flow to the south to existing recharge areas. Floodplain values and ecosystems are interrelated; ecosystems are discussed in Chapter 15, Ecosystem Resources. With the mitigation measures presented in Section 16.4.5, Mitigation Measures, the alternative would not result in a significant adverse impact on natural and beneficial floodplain values.

In summary, the Southern Freeway Alternative would not result in either a significant potential for interfering with a transportation facility needed for emergency vehicles or evacuation or a significant risk of upstream flooding. Furthermore, the impacts to natural and beneficial floodplain values would not be significant.

### **Southern Freeway Alternative with Tolling Option**

Under the Southern Freeway Alternative with Tolling Option, the overall facility design would not change compared to the non-tolled alternative, so impacts to floodplain resources would be the same as those from the Southern Freeway Alternative.

#### **16.4.4.2 2100 North Freeway Alternative**

As described in Chapter 2, Alternatives, this alternative would consist of a freeway extending from the Utah County line to SR 73 in Saratoga Springs and a lateral freeway extending east along 2100

North to I-15 in Lehi. Floodplain impacts that would result from this alternative are discussed below.

The 2100 North Freeway Alternative would result in one transverse crossing: 2100 North at the Jordan River. The 2100 North Freeway Alternative would not create any longitudinal crossings of the Utah Lake floodplain. The total length of the transverse crossing would be 1,000 feet, and 11 acres of floodplain would be affected.

When new hydraulic structures are designed, the Manual of Instruction would be used to determine the design flood. A 50-year or greater magnitude flood (one with a 2% annual chance of occurring) would be used to design freeway bridges

<b>2100 North Freeway Alternative Impacts</b>	
Total number of crossings (longitudinal)	0
Total number of crossings (transverse)	1
Total length of crossings (feet)	1,000
Total floodplain impacts (acres)	11



and culverts. Furthermore, design would satisfy FEMA requirements and local floodplain ordinances.

Floodplain impacts from this alternative would be minor because bridges and culverts would meet the design standards in the Manual of Instruction and because FEMA requirements and local floodplain ordinances would be followed. As described Section 16.4.4.1, Southern Freeway Alternative, a 2% (or less) annual chance of flooding is not considered significant, and designing bridges and culverts to pass the appropriate flood would reduce impacts to the transportation facility and the risk of upstream flooding. The 2100 North Freeway Alternative would not result in either a significant potential for interfering with a transportation facility needed for emergency vehicles or evacuation or a significant risk of upstream flooding. The alternative would not result in a significant adverse impact on natural and beneficial floodplain values.

### **2100 North Freeway Alternative with Tolling Option**

Under the 2100 North Freeway Alternative with Tolling Option, the overall facility design would not change compared to the non-tolled alternative, so impacts to floodplain resources would be the same as those from the 2100 North Freeway Alternative.

#### **16.4.4.3 Arterials Alternative**

As described in Chapter 2, Alternatives, this alternative would consist of a series of arterial roadways throughout northern Utah County. The combination of arterials includes a freeway segment

from the Utah County line to SR 73 and arterial roadways at Porter Rockwell Boulevard, 2100 North, and 1900 South. Floodplain impacts that would result from this alternative are discussed below.

The Arterials Alternative would result in seven transverse crossings: Porter Rockwell at the Jordan River, 2100 North at the Jordan River, 1900 South at the Jordan River (one at the river and one in the nearby shallow flooding zone), 1900 South at Dry Creek, 1900 South at Spring Creek, and 1900 South at the American Fork River. The Arterials Alternative would also result in three longitudinal crossings of the Utah Lake floodplain. The total length of the transverse and longitudinal crossings would be 17,600 feet, and 90 acres of floodplain would be affected.

Arterials Alternative Impacts	
Total number of crossings (longitudinal)	3
Total number of crossings (transverse)	7
Total length of crossings (feet)	17,600
Total floodplain impacts (acres)	90



When new hydraulic structures are designed, the Manual of Instruction would be used to determine the design flood. A 50-year or greater magnitude flood (one with a 2% annual chance of occurring) would be used to design freeway bridges and culverts. A 25-year or greater magnitude flood (one with a 4% annual chance of occurring) would be used to design bridges and culverts along principal arterials. Furthermore, design would satisfy FEMA requirements and local floodplain ordinances. If any structure is reused, its structural integrity and hydraulic capacity would be verified during the design phase of the project.

Floodplain impacts from this alternative would be minor because bridges and culverts would meet the design standards in the Manual of Instruction and because FEMA requirements and local floodplain ordinances would be followed. A 4% or less annual chance of flooding is not considered significant, and designing bridges and culverts to pass the appropriate flood would reduce impacts to the transportation facility and the risk of upstream flooding. The Arterials Alternative would not result in either a significant potential for interfering with a transportation facility needed for emergency vehicles or evacuation or a significant risk of upstream flooding. The alternative would not result in a significant adverse impact on natural and beneficial floodplain values.

### **Arterials Alternative with Tolling Option**

Under the Arterials Alternative with Tolling Option, the overall facility design would not change compared to the non-tolled alternative, so impacts to floodplain resources would be the same as those from the Arterials Alternative.

### 16.4.5 Mitigation Measures

Measures will be taken to reduce floodplain impacts and to ensure that constructing the MVC complies with all applicable regulations. These measures include the following:

- The proposed alternatives would require a number of stream crossings. When hydraulic structures are designed, the design will follow the UDOT Manual of Instruction and FEMA requirements, where applicable, to determine the design flood to use for the design of all bridges and culverts necessary for these stream crossings. Where existing bridges or culverts are reused, their structural integrity and hydraulic capacity will be verified during the design phase of the project.
- Stream alteration permits will be obtained for all stream crossings. Floodplain development permits will be obtained for all locations where the proposed roadway would encroach on a regulatory floodplain, and structures will be designed to meet the more stringent of FEMA requirements and local floodplain ordinances. FEMA requires that construction within a floodway must not increase the base 100-year flood elevation. By meeting these requirements, the risk of upstream flooding will be reduced.
- Roadway elevations will be above adjacent floodplain elevations, where those elevations are defined, so that flooding will not interfere with a transportation facility needed for emergency vehicles or evacuation.
- In areas of longitudinal crossings such as near Utah Lake, floodplain equalization culverts or other surface water conveyance structures will be installed to allow flood waters to flow freely between the northern and southern sides of the Southern Freeway Alternative and the Arterials Alternative, 1900 South alignment. The conveyance structures will also be designed to maintained wetland hydrology if feasible. Furthermore, erosion-control measures will be implemented at these structure locations. These actions will reduce impacts to natural and beneficial floodplain values.

### 16.4.6 Cumulative Impacts

Cumulative impacts were analyzed for local and regionally important issues (farmlands, air quality, water quality, and ecosystems) as developed with resource agencies and the public during scoping. See Chapter 25, Cumulative Impacts, for a more detailed discussion of cumulative impacts.

## 16.4.7 Summary of Impacts

Table 16.4-5 summarizes the floodplain impacts from each combination of alternatives and options in Salt Lake County and Utah County.

**Table 16.4-5. Floodplain Impact Summary**

Alternative <sup>b</sup>	Impacts <sup>a</sup>			
	Number of Crossings		Total Length of Crossings (feet) <sup>c</sup>	Total Floodplain Impacts (acres) <sup>d</sup>
	Longitudinal	Transverse		
5800 West Freeway / 5600 West Transit / Southern Freeway				
Dedicated Transit	3	24	20,200	143
Mixed Transit	3	24	20,200	143
5800 West Freeway / 5600 West Transit / 2100 North Freeway				
Dedicated Transit	0	20	4,400	38
Mixed Transit	0	20	4,400	38
5800 West Freeway / 5600 West Transit / Arterials				
Dedicated Transit	3	26	21,100	117
Mixed Transit	3	26	21,100	117
7200 West Freeway / 5600 West Transit / Southern Freeway				
Dedicated Transit	3	24	20,400	148
Mixed Transit	3	24	20,400	148
7200 West Freeway / 5600 West Transit / 2100 North Freeway				
Dedicated Transit	0	20	4,600	43
Mixed Transit	0	20	4,600	43
7200 West Freeway / 5600 West Transit / Arterials				
Dedicated Transit	3	26	21,300	122
Mixed Transit	3	26	21,300	122

<sup>a</sup> Impacts summarized in this table are totals for both Salt Lake County and Utah County alternatives. Total impact includes transit.

<sup>b</sup> Dedicated Transit = Dedicated Right-of-Way Transit Option; Mixed Transit = Mixed-Traffic Transit Option

<sup>c</sup> Total lengths of crossings rounded to nearest 100 feet.

<sup>d</sup> Total floodplain areas rounded to nearest acre.

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